Notes.

THE earthquake felt on September 7 in the north of Tuscany proves to have been much more serious than the early accounts indicated. Many towns and villages are completely destroyed. The epicentre seems to have been near Fivizzano, a small town, now a heap of ruins, on the slope of the Apennines, and about twelve miles north of Carrara. The area within which buildings were damaged is evidently extensive, as it includes both Viareggio and Pistoia, the latter town being about forty-five miles south-east of Fivizzano. The number of deaths so far reported is 327, but the real number is probably much higher. The earthquake appears to be the most violent known in this part of Italy, which is fortunate in possessing a meagre seismic history. On April 11, 1837, an earthquake, with its centre about five miles south-east of Fivizzano, caused some damage in that town. On September 10, 1878, a strong shock, with its centre close to Fivizzano, again injured a few houses there. Indeed, the recent wholesale destruction of villages is evidence of their long immunity from violent earthquakes, for the buildings were not of that resisting type the construction of which is now enforced in the rebuilt towns of Italy.

IN the detailed exploration of the coasts of Greenland Danish explorers have taken a leading part. Plans of a new expedition under the leadership of Mr. Lauge Koch have been sent to us by Dr. M. P. Porsild, of the Danish Arctic Station in Disko, Greenland. In order to commemorate the voyage of Hans Egede to Greenland in 1721, which began the systematic settlement of the west coast by Denmark, Mr. Koch's expedition is known as the Bicentenary Expedition to the North of Greenland. The Danish Government has provided a vessel and part of the funds, the remainder of the cost being met by subscription in Denmark. The expedition left Copenhagen on July 15 for Robertson Bay in Inglefield Gulf, where a wintering station is to be established. From there a depôt is to be laid in Warming's Land. It is hoped that this will be done in the late summer with the help of motor-tractors. The journey to the depôt will be repeated next year with dog-sledges, and the main work of the expedition will then begin. This includes journeys to the interior of Peary Land and to the north of Adam Biering's Land, where an advanced base will be established. Independence Fjord, Böggild's Fjord, and the unknown parts of Wulff's Land and Warming's Land will be mapped. In the following spring the expedition will travel along the coast from its winter quarters through Kennedy and Robson Channels, round the north of Peary Land into Independence Fjord. The return journey will be made by the main depôt to Robertson Bay. Mr. Koch is accompanied by Mr. C. F. Slott and several Eskimo.

THE *British Medical Journal* for September 11 announces that the International Society of Surgery, at its recent meeting in Paris, elected Sir William Macewen, of Glasgow, as its president for the next congress, to be held in Great Britain—probably in London—during the summer of 1923.

THE British Launderers' Research Association has been approved by the Department of Scientific and Industrial Research as complying with the conditions laid down in the Government scheme for the encouragement of industrial research. The secretary of this association is Mr. J. J. Stark, 162–65 Bank Chambers, 329 High Holborn, W.C.1.

THE Royal Academy of Science of Turin has sent us a leaflet announcing the offer of two Bressa prizes of 9000 lire for the greatest work in almost any branch of science during the past four years. Candidates may submit printed (not written or typed) works to the Secretary before December 31, 1922. Members of the Turin Academy are not eligible to compete for the prizes.

THE eighth annual Indian Science Congress will be held in Calcutta from January 31 to February 5, 1921. His Excellency the Right Hon. the Earl of Ronaldshay has consented to be patron of the meeting, and Sir R. N. Mukerjee will be president. Members intending to read papers should send them, together with a short abstract, to Mr. P. S. MacMahon, Canning College, Lucknow, before November 30.

THE Secretary for Scotland has appointed an Advisory Committee to advise him on matters connected with the administration of the Wild Birds Protection Acts. The Committee consists of Mr. Hugh S. Gladstone (chairman), Dr. W. Eagle Clarke, Dr. Walter E. Collinge, Mr. H. M. Conacher (representing the Board of Agriculture for Scotland), Mr. H. J. Crowe (representing the Fishery Board for Scotland), and Prof. J. Arthur Thomson.

THE widespread, popular belief in the use and value of the divining rod gives considerable interest to a recent publication of the United States Geological Survey on the subject. "The Divining Rod," by Mr. A. J. Ellis (Water-supply Paper 416), is a condensed history of water-witching, to which is added a bibliography with many hundred entries. The origin of the divining rod is lost in antiquity, but a belief in its value for a variety of purposes besides water-finding has persisted until the present day. The U.S. Geological Survey considers that for all practical purposes the matter is thoroughly discredited and of no value whatever in locating either water or mineral ores. Mr. Ellis adds a note on various mechanical "water-finders," most of which are magnetic or electrical instruments. He dismisses the claims of all these contrivances as being purely speculative and quite unsound in principle.

THE *Geographical Journal* for July (vol. xvi., No. 1) gives a summary by Dr. Hamilton Rice of his recent expedition to the headwaters of the Orinoco. Dr. Rice's route was from the Amazon up the Rio Negro to the Orinoco. Esmeralda was reached at the end of last year. The Orinoco was then ascended to the rapids of Guaharibos, where Dr. Rice's party of ten was attacked by a big band of Guaharibos and compelled to fight. Material has been obtained for a map traverse on a scale of 1 : 125,000 of the route from Manáos to the Guaharibos rapids. The traverse is checked by more than forty astronomical stations, where time was obtained by field wireless from Darien and Washington. Magnetic observations were taken at more than twenty of the stations. Meteorological readings were taken four times daily in conjunction with similar readings at the same hours at Para. Much attention was paid to geological research. Finally, Dr. Rice says that the survey of the diseases encountered will form one of the not least valuable results of the expedition.

THE problem of suitable maps for aviators continues to attract much attention and is far from being satisfactorily solved. In the *Geographical Journal* for August (vol. lvi., No. 2) Capt. H. A. Lloyd has a short paper, illustrated by many admirable photographs, on the classification of the ground from the air. Experience on the Western front during the war convinced Capt. Lloyd that the whole area could be divided into distinctive zones differentiated by the shapes of fields or by the industries carried on in particular localities. A recognition of these types of terrain was found to enable a pilot to determine his approximate position. This was particularly valuable in the case of a pilot losing his way owing to clouds or in flight over the country for the first time. Thirteen types of ground were recognised and taught to pilots in the area of the Western front between the sea and the River Oise. Under war conditions this classification had its limitations because the destructive effect of battle, as a rule, removed all features visible to the eye and generally to the camera. It is also noted that, under normal conditions, while the shape of the fields and other features remain constant, the height of the vegetation affects the appearance of the photograph. Thus a field of ripe corn may look almost as dark as a row of trees. These seasonal variations would need to be taken into account in making use of such a classification in map-construction. Capt. Lloyd also discusses the classification of landmarks, and insists that small-scale maps, such as are used in flying, should portray the chief features of towns so that a glimpse of a town would be enough for an aviator to locate his position. These considerations entail the omission of much of the detail shown on maps for land use, so that the features conspicuous from the air may stand out boldly.

A PROSTRATE variety of potato has been found in the breeding experiments of Messrs. R. N. Salaman and I. W. Lesley (*Journal of Genetics*, vol. x., No. 1), which, it is suggested, may be useful for potato-growers in semi-arid climates, since the foliage, lying on the ground, has a considerable effect in conserving the soil moisture. This variety breeds true, and is shown to differ from the upright type in a failure to form secondary xylem in the stem. A procumbent variety, the stems of which turn up at the end, has also appeared. Anatomically, it agrees with the prostrate variety. In both these types the crop of tubers is unaffected.

IN an interesting further study of melanism in moths, Mr. J. W. H. Harrison (*Journal of Genetics*, vol. x., No. 1) discusses crossing experiments with *Tephrosia bistortata*, *T. crepuscularia*, and their melanic varieties. The melanic variety of *T. crepuscularia* behaves as a simple Mendelian dominant to the type, and the same has been shown to be true of various other melanic varieties. But in crosses of *T. bistortata* with the melanic form of the other species a great range of colour forms was obtained in F_2 and F_3, with no indication of Mendelian segregation. The results are interpreted as showing that the unit factor for melanism has been modified, and in some cases broken up so that it has practically disappeared.

As a first study of inheritance of egg-weight in fowls, Philip Hadley and Dorothy Caldwell (Bull. 181, Rhode Island Agr. Expt. Station) make an analysis of the normal distribution of egg-weight in White Plymouth Rocks. Egg records from a flock of thirty-nine hens through eight years showed that individual hens differed markedly in the weight of eggs laid in any period. The first eggs of any year are smaller, increasing to a maximum in April, then falling to a minimum in July or August, followed by another maximum and minimum in September and November respectively. After the second laying year these maxima appear less clearly, and after the fourth there is a progressive decrease in the weight of eggs produced each year. There appears to be a slight tendency for heavier hens to lay larger eggs.

THE attention of workers on Diptera is directed to Mr. E. Brunetti's catalogue of Oriental and South Asiatic Nemocera, which has been published as vol. xvii. (300 pp., June, 1920) of the Records of the Indian Museum. Mr. Brunetti states that he has included in his catalogue all the names of species available up to the middle of 1919. In nomenclature his policy has been to retain the names employed by the principal dipterologists of the last century; he believes in "continuity before priority," and does not agree with the general overturning of generic and specific names, suggested by strict priorists, which arises out of the much discussed "1800 paper" of Meigen. For each species the author gives the essential bibliographical references and synonyms, and indicates the distribution. The location of the type-specimen, where this is known, is stated. The Culicidæ (mosquitoes) receive careful consideration, and the list of these extends over ninety-six pages of the catalogue.

IN view of the present scarcity in the supply of cotton, the attempts now being made to establish cotton-growing on a large scale in Mesopotamia are of particular interest. Cotton has been grown in Mesopotamia from very ancient times, and is still cultivated in small quantities by the Arabs in conjunction with food-crops along the banks of both the Tigris and Euphrates. The fibre is used locally for spinning and as a stuffing material for pillows and mattresses. The country possesses a soil and climate favourable to the production of large yields of excellent cotton, and in course of time it should add materially to the world's supply. Since 1917 experiments have been conducted by an expert from the Indian Agricultural Service with the view of discovering the most suitable kinds to grow, and the results of the work done in this connection and the prospects of establishing a cotton-growing industry are fully dealt with in the current number of the Bulletin of the Imperial Institute. So far, American types of cotton seem to be the most suitable for cultivation in Mesopotamia. The members of a deputation of the British Cotton Growing Association which visited the country towards the end of last year were very favourably impressed with its possibilities for cotton production.

THE July-August issue of the *Scottish Naturalist* (Nos. 103 and 104, pp. 99-144) is devoted to a report on Scottish ornithology in 1919 by Miss Leonora Jeffrey Rintoul and Miss Evelyn V. Baxter—a careful piece of work in which many contributors have assisted. The most interesting feature of 1919 is the extension of the breeding range of certain species. Of these the most important is the reappearance of the Whooper swan as a Scottish breeding species. Migration ran a fairly normal course; the cold spring seemed to have no effect on the arrivals of summer visitors. A very large movement took place in the first half of May, but no very big migrations are recorded in autumn, the only one of any magnitude being a weather movement in mid-November caused by the very hard frost and snow at that time. No new birds were added to the Scottish list, but a good many uncommon visitors and new records for particular faunal areas are noted, *e.g.* a blue-headed wagtail at Fair Isle, a red-backed shrike in Moray, two reed-warblers from Lerwick, a bee-eater at Lentran, two American widgeon from Tay and Clyde, and a spotted crake from Ross-shire. The garden-warbler and the pied flycatcher were both found nesting in the Moray area. The report deals also with the decrease of certain species in various areas, with varieties of plumage, with the noteworthy phenomena of the various seasons, and with peculiarities of habit, such as carrion-crows acting as foster-parents. It is cheering to read that on October 5, at Swordale, East Ross, a golden eagle, two buzzards, and a peregrine falcon were all seen in the air together. The authors are to be congratulated on the continuation of their valuable series of annual reports.

IN Professional Paper 98-L of the U.S. Geological Survey, Messrs. G. C. Matson and E. W. Berry provide the first description of a North American Pliocene flora. This comes from the Citronelle formation of the Gulf coastal plain, extending from western Florida to eastern Texas, and indicates climatic conditions in late Pliocene time similar to those of the present day. The modern forest flora is well illustrated in its habit as it lives, to furnish a picture of the Pliocene period.

MR. JOHN PARKINSON introduces the term "lak" into geography in his "Report on the Geology and Geography of the Northern Part of the East Africa Protectorate" (Colonial Reports—Miscellaneous, No. 91, 1920). A lak is a drainage-channel that may carry water periodically; it is often a guide to the capacity of an area for development. On the banks of some laks in East Africa the abundance of molluscan shells indicates the former existence of extensive lakes, and the water-supply found in the wells may be a relic of these lakes in a region that has clearly suffered from desiccation.

DRUMLINS, kames, and eskers play a large part in the topography of northern temperate lands in Europe and America, and their relations are well illustrated in maps and landscapes in Mr. W. C. Alden's important memoir on "The Quaternary Geology of South-eastern Wisconsin" (U.S. Geol. Surv., Prof. Paper 106, 1918). The distribution of the drumlins of the Green Bay glacier west of Lake Michigan, and of the subglacial eskers, is a very striking feature of the large "surficial" map. Would the U.S. Survey consider the folding of its maps with the printed side outwards, as is done by the Ordnance Survey of the British Isles, following the plan adopted by so many travellers in their field-work?

A CATALOGUE of the Mesozoic and Cenozoic Plants of North America, by F. H. Knowlton, has been issued as Bulletin 696 of the United States Geological Survey. It contains 815 pages, and should form a useful work of reference. The catalogue is an alphabetically arranged list of the genera and species that have been described. For each American form that is known only in a fossil state the original date and place of publication are given; then follow all or the most important references, especially such as refer to descriptions and figures. For each Old World form that is recognised in North American strata the original date and place of publication are given; a reference to the publication in which the form is first recorded as American follows, and then in chronological order the American references. For living species found fossil only the authority is given, followed by the first reference to the species in a fossil state, and then by other important references. The synonymy is placed under the species to which it belongs, but each synonym occurs in its proper alphabetical place with a reference to the form to which it is now referred. The catalogue is supplemented by a systematic arrangement of the genera and an index of genera and families. There are also a list of the North American Mesozoic and Cenozoic plant-bearing formations, with the plants found in each alphabetically arranged, and a bibliography.

THE Report issued by the United States Geological Survey of the world's production of copper in 1917 has recently been published. For many years the U.S.A. has been the largest producer of this metal. In 1913 its production was about 57 per cent. of the world's output of just under one million tons. During the war there was a greatly increased use of this metal, and the demand of the belligerent countries was satisfied principally by a very large increase in American production. The high-water mark was reached in 1917, when a grand total of 1·454 million tons was extracted. Of this the U.S.A. produced 0·855 million tons. Japan and Chile also increased their smelter production to a little more than 100,000 tons. Then follow Canada, Mexico, and Peru. It will be seen, therefore, that by far the greater part of the world's copper was derived from the western hemisphere. It is evident that the U.S.A. is the largest single factor in nearly every phase of the industry. At present it is not only much the largest producer and consumer, but it also excels in both imports and exports. At the beginning of 1917 the producing capacity was the largest in the history of the industry, and was almost wholly utilised. The principal producing State was Arizona, followed by Montana, Michigan, and Utah. These four States provided 79 per cent. of the total American output in 1917.

MR. T. SHEPPARD, whose careful record of William Smith's maps and memoirs has just been published by Messrs. Brown and Sons of Hull, chose "The Evolution of Topographical and Geological Maps" as the subject of his address to the Delegates of Corresponding Societies at the British Association meeting in Cardiff. He showed how incomplete our collections are of county maps, while such publications are occasionally used by dealers for the wrapping of book-parcels. Great credit is very properly assigned to John Cary's work in England from 1787 to 1832; his large road-map, with the coach-roads coloured in blue, is on the scale of five miles to one inch, not ten as stated, and, with its index of every village, is still of great value in a private library. In citing maps published after the initiation of the Ordnance Survey, those of Scotland by Faden and Wyld, on the basis of surveys by General Roy and John Ainslie (1839), and by Arrowsmith, scale four miles to one inch (1840), used as the basis of MacCulloch's fine geological map, are worthy of mention. MacCulloch seems to have completed his share in this map in 1834. The second and most authoritative edition of Griffith's map of Ireland was issued in 1855, not 1853, as given in the address. Attention is well directed to the "soil-maps," in reality precursors of our "drift-maps," published in connection with agricultural and statistical surveys about the beginning of the nineteenth century. That of Londonderry by Sampson in 1802, with its blue boulder-clay and pink sands and gravels, interestingly anticipates our modern colouring. Mr. Sheppard's address as now printed is a welcome work of reference.

MONTHLY results of magnetical, meteorological, and seismological observations at the Royal Alfred Observatory, Mauritius, to April, 1920, have been received. Hourly observations of the magnetic declination, horizontal force, and vertical force are given from the photographic records. There are similar observations for each hour of atmospheric pressure, direction and velocity of wind, temperature of the air and evaporation, amount of cloud, duration of bright sunshine, and rainfall, most of which are from self-registering instruments. Monthly rainfall totals are given for about 100 stations in Mauritius, grouped according to the river systems. The monthly and yearly means and extremes of the meteorological elements at the Royal Alfred Observatory for 1919 are tabulated. July had the highest mean atmospheric pressure, and February and March the lowest. The absolute highest temperature was 34·9° C. in January, and the lowest night minimum 13·0° C. in August. The mean of the daily maxima was highest, 32·1° C., in January, and lowest, 23·4° C., in July. The mean of the night minima was lowest, 16·3° C., in August, and highest, 23·3° C., in February. The degree of humidity, saturation 100, was highest, 78, in March, and lowest, 69, in November. The amount of rain was greatest, 202·7 mm., in March, and least, 24·3 mm., in May, the total for the year being 1001·6 mm.

"NOTES on the Ground Day Visibility at Cranwell, Lincolnshire," by Capt. W. H. Pick, published by the Meteorological Office as Professional Notes No. 11, is an attempt to find the relations existing between visibility and wind direction, wind velocity, and distribution of pressure. The period dealt with is from February 1 to April 8, 1920, and for hourly observations from 9h. to 17h. G.M.T. It is shown that winds in the south-west quadrant brought the best visibility, winds between west and east through north a considerably lower degree, and winds in the south-east quadrant the lowest degree. It is pointed out that visibility with winds greater than 12 m.p.h. was much higher than it was with winds less than or equal to 12 m.p.h. Classification according to pressure distribution shows that the mean visibility in front of a depression is 5·1 of visibility-scale (0–9), in the rear of a depression 5·0, and in a secondary depression 4·9. In an anticyclone or wedge it is 3·9 of scale, in a col 4·7, and with straight isobars south to north 3·2, west to east and south-west to north-east 5·5. The period of observation discussed—sixty-eight days of nine consecutive hours each—is far too short. The situation of Cranwell and its proximity to hills would render the conditions found quite different from those in many other parts of the British Isles, or on the open sea contiguous to our coasts. The relations between visibility and pressure distribution seem open to doubt. No attempt has been made to ascertain the relation of visibility to time of day.

THE August issue of the Journal of the Society of Glass Technology contains the paper on the properties of the raw fireclays found in this country which was communicated to the meeting of the society in April by Miss E. M. Firth, Mr. F. W. Hodkin, and Dr. W. E. S. Turner. Twenty-seven clays were examined, only five of them falling within the specification of the Refractories Research Committee of the society as suitable for glass-furnaces. The results show no correlation between the physical properties and chemical compositions of the clays, and the authors conclude that the classification of clays according to chemical composition is premature, and should be replaced by one according to their shrinkage and porosity. Most of the clays tested show expansion at some part of the firing range, owing probably to the allotropic changes in the silica present. In general, clays with high alumina content show a wide range of porosity, but there are notable exceptions. From the tables of the properties of the various clays given by the authors it is possible to calculate the properties of a mixture of them when fired to a given temperature.

CONTINUING his researches on the alloys of iron with chromium and tungsten, Prof. Honda has recently published in the Science Reports of the Tôhoku Imperial University an investigation on the structural constitution of high-speed steels containing these elements. He concludes that in an annealed steel containing 5 per cent. of chromium, 18 per cent. of tungsten, and 0·6 per cent. of carbon the alloy consists of a solution of iron tungstide in iron, together with free tungstide and the carbides Cr_4C and WC. On heating such a steel above Ac_1 the carbides dissolve, and the chromium carbide Cr_4C is converted into Cr_3C_2 and metallic chromium. The higher the temperature, the more the change proceeds in this direction. On cooling, the reverse change takes place only slightly, and the result is that at the ordinary temperature a steel is produced containing the carbides, chromium, and the tungstide all in solid solution. This, according to him, is the constitution of the hardened steel. The self-hardening property is conveniently studied by the temperatures of the transformations, while the degree of tempering on later heating is best studied by means of magnetic heating curves. The tempering takes place in two steps—one at about 400° and the other above 700°. Prof. Honda concludes that self-hardening and resistance to tempering depend primarily on the quantity of Cr_3C_2 dissolved in iron containing chromium and tungstide. These properties increase both with chromium and carbon and with rise of temperature. The function of tungsten appears to consist in lowering the temperature, at which self-hardening begins to be manifest. When this element exceeds 12 per cent. it exists as fine globules of tungstide Fe_2W, and these are directly related to the cutting efficiency of the tool.

WE have just received from W. Heffer and Sons, Ltd., of Cambridge, a catalogue of their library of second-hand books. Science and mathematics are well represented by a number of the bigger text-books, and several collections of bound volumes of scientific journals are also offered for sale.

THROUGH the omission of the word "hundred" from line 28 of the first column of page 38 of last week's NATURE, the annual production of coal in Great Britain was erroneously stated to approach "three million" instead of "three hundred million" tons. It is shown in the article upon the proceedings of the Section of Economics and Statistics of the British Association, printed elsewhere in this issue, that the output in 1913 was 287,000,000 tons.

Our Astronomical Column.

TEMPEL'S COMET.—This comet is now fading, but may still be visible for some weeks. The following ephemeris, for Greenwich midnight, is by M. Ebell:

		R.A.	S. Decl.			R.A.	S. Decl.
		h. m. s.	° ′			h. m. s.	° ′
Sept.	17 ...	3 1 5	8 27	Oct.	3 ...	2 51 44	10 53
	21 ...	2 59 45	9 8		7 ...	2 47 59	11 21
	25 ...	2 57 42	9 46		11 ...	2 43 50	11 44
	29 ...	2 55 0	10 22		15 ...	2 39 24	12 1

Values of log *r*, log Δ: September 21, 0·2364, 9·9411; October 15, 0·2737, 9·9730.

A photograph obtained at Bergedorf on August 15 showed a well-defined nucleus and a fan-shaped tail which could be traced for about 1′. The corrections indicated to Ebell's ephemeris were +23s., S. 3·0′.

NOVA CYGNI.—The position of this star referred to the equinox of 1920·0 is R.A. 19h. 56m. 24·77s., N. decl. 53° 24′ 1·3″; annual precession, +1·50s., +9·7″. Examination of past photographs shows no trace of a star in this place on plates taken by Dr. Wolf and Mr. Franklin Adams some fifteen and twelve years ago. They go down to mag. 17 and 15 respectively. Two plates taken at Harvard on 1920 August 9 with a 1-in. lens fail to show it, and it must have been fainter than 9·5. A plate taken by Mr. Nils Tamm in Sweden on August 16 shows it of mag. 7, and a Harvard one of August 19 indicates mag. 4·8. Since the maximum was not reached until August 24, the rise in light occupied more than a week. The total increase in light was at least 15 magnitudes, while that of Nova Aquilæ 1918 was only 11 magnitudes (Harvard Bulletin, 729; *Astr. Nachr.*, 5060).

THE PERTH SECTION OF THE ASTROGRAPHIC CATALOGUE.—The publication of the great Astrographic Catalogue has fallen far behind the expectations that were formed when the scheme was initiated some thirty years ago, but many new observatories have stepped in to fill gaps left in the zones, and these are showing much energy in pushing on their share of the work. The Perth Observatory, under the direction of Mr. N. B. Curlewis, undertook the region from −31° to −41°. The Catalogue will be completed in thirty-six volumes, each containing six hours of R.A. in a single degree of declination. Vols. xvii. to xxiv. have recently been issued. The following table gives the number of stars in each volume and the ratio to the number in C.P.D.:

Plate centre	R.A. 0h.–6h.		R.A. 6h.–12h.		R.A. 12h.–18h.		R.A. 18h.–24h.	
	No. of stars	Ratio	No. of stars	Ratio	No. of stars	Ratio	No. of stars	Ratio.
−36°	7,740	4·7	21,923	2·5	20,766	4·1	19,832	5·0
−37°	7,664	4·4	21,883	2·6	20,667	3·5	14,562	3·8

It will be seen that the ratio varies considerably, being, on the whole, lowest where the star-density is greatest.

The radius of the image is given for stars not fainter than magnitude 8. The fainter stars have their magnitudes indicated by a letter (from A to L) referring to a specially constructed scale; approximately A is of magnitude $8\frac{1}{2}$, and the letters are half-magnitudes apart, so that L is $13\frac{1}{2}$.

The *étoiles de repère*, of which there are about fifteen on each plate, have recently been re-observed with the Perth meridian-circle, and proper motions deduced where necessary. The measured rectangular co-ordinates of all the stars are given to 0·001 of a *réseau* interval. The usual plate-constants and tables for reduction to R.A. and declination are also given, with a note that the constants are deduced on a somewhat different plan from that followed at Greenwich.